

**NATIONAL RENEWABLE ENERGY LABORATORY  
ENVIRONMENTAL REPORT  
FOR  
1999**

Prepared by:  
Environment, Safety & Health Office  
National Renewable Energy Laboratory

NREL is a national laboratory of the  
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## 1. INTRODUCTION

The National Renewable Energy Laboratory (NREL) is owned by the U.S. Department of Energy's (DOE), and conducts research primarily for DOE's Office of Energy Efficiency and Renewable Energy (EE). NREL is operated by the Midwest Research Institute, Battelle, and Bechtel under the direction of the DOE Golden Field Office (GO). NREL is the nation's primary laboratory dedicated to the research, development and deployment of economically viable renewable energy and energy efficiency technologies.

### 1.1. Purpose

This report presents a summary of NREL's environmental protection programs and activities for 1999. It is organized according to the different environmental media (e.g. air, waste, ground water, etc.), and includes a brief summary of how the program is managed in that area, any permitting or notification efforts that have been completed during the reporting period or are ongoing, and activities that have occurred during the reporting period in that environmental area. A description of the environmental condition and features of NREL's sites is also included to provide a basis for the program overview.

### 1.2. Background

NREL's mission is: To lead the nation toward a sustainable energy future by developing renewable energy technologies, improving energy efficiency, advancing related science and engineering, and facilitating deployment. NREL fulfills its mission through technology portfolios; a brief description of each major technology area follows.

*Photovoltaics:* Photovoltaics is the direct conversion of sunlight to electricity using solid-state materials. The National Center for Photovoltaics develops and deploys photovoltaic (PV) technology for the generation of electric power.

*Wind Energy:* Through the National Wind Technology Center, NREL develops, improves, and demonstrates the viability of wind technology for electricity generation and facilitates its deployment throughout the world

*Bioenergy:* NREL currently has major programs in both biomass-derived fuels (biofuels) and biomass-derived electricity (biopower), and projects in biomass-derived chemicals and materials.

*Renewable Thermal Technologies:* These technologies generate power from heat or utilize heat from renewable resources. They include concentrating solar power, solar water heating, and geothermal heat and power.

*Distributed Power:* NREL participates in the development of technologies, market structures, and policies that affect the incorporation of renewables and energy

efficiency technologies in distributed power systems, maximizing the deployment of renewable energy and energy efficiency products. As a part of this initiative, NREL is involved in the development, design, and deployment facilitation of renewable and renewable/fossil hybrid distributed power systems in grid-connected applications.

*Building Energy:* NREL increases the use of energy efficiency technologies and expands the use of renewable energy technologies in the building sector by working to develop new, cost-effective, and environmentally acceptable building equipment and envelope systems.

*Hydrogen:* NREL serves as a leader in renewable hydrogen production technologies as well as in advanced storage and sensor development. Basic and applied research and material development using biology, physics, and chemistry enable and support the development of hydrogen production, storage, and end-use systems.

*Advanced Vehicles:* NREL works with industry to develop advanced vehicles and systems for transportation, and to develop viable vehicle systems that are integral to DOE transportation initiatives.

*Advanced Fuels:* NREL works with energy companies and manufacturers of vehicles and engines to develop advanced motor vehicle fuels for improved energy and environmental performance. A systems approach is used to develop optimized engine management, fuel, and emission control technologies.

*Basic Science:* The basic science that underlies NREL's technologies is currently focused on materials growth and analysis for photovoltaics and related technologies; solid-state theory and characterization; superconductivity; advanced materials and concepts such as semiconductors and metals; photoconversion, which is using innovative approaches to converting solar photons to fuels, chemicals, and electricity; electrochemistry as applied to fuel cells, solar hydrogen production, advanced batteries, and electrochromic devices; catalyst design that includes converting carbon dioxide to fuels and products; and microbiology and biochemistry applied to converting biomass into energy and products.

### **1.3. Site and Facility Description**

NREL facilities occupy four separate locations in Jefferson County, Colorado, near the city of Denver. The four facilities are the Denver West Office Park (DWOP), the South Table Mountain site (STM), the Joyce Street Facility (JSF), and the National Wind Technology Center (NWTC). The DWOP and STM sites are approximately 2 miles (3.2 km) east of Golden and 12 miles (19.3 km) west of central Denver. The NWTC is adjacent to the DOE Rocky Flats Environmental Technology Site, approximately 15 miles (24.2 km) north of the STM site. The JSF is located at 6800 Joyce Street, approximately 5.5 miles (8.9 km) north of the DWOP and STM sites. Figure 1.1 illustrates the locations of the four sites on a regional map. Figure 1.2

provides a more detailed map of the STM site, and Figure 1.3 gives a more detailed map of the NWTC site.

The STM and NWTC sites are the two main sites where research operations are conducted. These two sites will be addressed separately in the discussion of environmental features. The DWOP is leased space used primarily for administrative functions and limited research activities. The JSF is also a leased space that is used primarily for storage.

## **2. SITE ENVIRONMENTAL CONDITIONS/FEATURES**

Photos for each site documenting the site features and development as they existed during 1999 are included at the end of this section. Figures 2.1, 2.2, and 2.3 illustrate the South Table Mountain site, and Figures 2.4, 2.5, and 2.6 illustrate the National Wind Technology Center site. The views on the STM site also illustrate the conservation easement property and the newly acquired Camp George West property.

### **2.1. South Table Mountain Site**

#### *Geology, Soils, and Hydrogeology*

The STM site is a roughly triangular parcel of land occupying portions of the top, sides, and lower south-facing slopes of South Table Mountain. South Table Mountain is composed of sedimentary rocks below a basalt lava cap, which is quite resistant to erosion. The South Table Mountain feature is a mesa that stands about 150 meters above the adjacent lowlands. It was formed by the erosion of weak sedimentary rocks surrounding the mesa's erosion resistant lava cap. Below the lava caprock, the sedimentary rocks are part of the Denver Formation that consists of layers and lenses of claystone, sandstone, and conglomerate. Sedimentary rocks of the Arapahoe Formation underlie the Denver Formation.

Both the Arapahoe and Denver Formations are considered to be aquifers in portions of the Denver Basin. The Denver Formation underlies the areas on which most NREL construction has taken place. Groundwater on the STM site occurs primarily in the weathered and fractured silts and sands of the Denver Formation. There may also be some groundwater in the form of perched aquifers below the basaltic lava cap on the South Table Mountain and within the materials above the Denver Formation, which are largely the result of stream deposits. Groundwater flow on the site is in a southeasterly direction.

The soil covering the top of South Table Mountain is Lavina Loam. A loam is composed of a mixture of clay, sand, silt, and organic matter. The loam on the mesa top is a shallow, well drained clayey soil. Soil on the upper side slopes of South Table Mountain is also a loam consisting of extremely stony soils with

## **Figure 1.1 – Regional Map**

## **Figure 1.2 – STM Site Detail**



### **Figure 1.3 – NWTC Site Detail**

significant amounts of clay. Much of the remainder of the site, including the area designated for major development, has a deep, well drained soil referred to as Denver clay loam. It consists of clayey material containing some calcium carbonate. There are also two smaller soil areas on the southwestern portion of the site, both of similar character to other site soils: cobbly clay loam and very stony clay loam.

#### Surface Water

About 90% of the surface drainage off the site, both the mesa top and across the lower portions of the site, is in the southerly direction toward Lena Gulch (a tributary of Clear Creek). Two drainageways on the eastern most portion of the site are intercepted by Welch Ditch, which ultimately flows into Lena Gulch.

There is no permanent stream flow on the STM site. Only occasional flow derived from extended periods of precipitation, usually during the late winter and early spring, is found in the drainage channels with seasonal springs evident along some of the mesa slopes. There is one seep on the mesa top that is active throughout most of the year, but the water infiltrates and evaporates quickly during dry times of the year.

#### Vegetation

Two primary vegetation types are present on the STM site: grasslands and shrublands. The most common plant communities on the STM site are mixed grasslands, comprising over 80% of the vegetation on the site. These communities are generally dominated by short- and mid-grass species. Two primary upland shrub communities occur on the STM site: mountain mahogany shrublands, found on the shallow soils of the mesa, and upland shrubland, occurring in drainages lacking active channels as well as drainages with associated wetlands. Recent field surveys have identified limited wetland/riparian areas along drainages. The wetland communities identified on the STM site are a very minor component of the total vegetation cover, accounting for less than 1% of the vegetation over an area of less than 0.3 ha (0.75 ac). Riparian shrub communities also occur adjacent to the emergent wetlands.

#### Wildlife

A wildlife survey was conducted on the site during 1986 and 1987, and additional surveys were done in 1999 over the Conservation easement property. Mammals seen using the site during the survey were the mule deer, coyote, grey fox, red fox, raccoon, longtailed weasel, striped skunk, spotted skunk, badger, bobcat, mountain lion, rabbits, and yellow-bellied marmots. Seventeen species of birds were observed on the STM site, along with two species of raptors: kestrels and two nesting pairs of red-tailed hawks. NREL personnel have reported numerous sightings of snakes as well as a golden eagle. A variety of amphibian species are expected to inhabit the area.

### Land Use

The STM site is a 131.5-hectare (325 acre) area predominantly bordered by open grassland zoned for recreation and light-commercial activity. A vacant parcel of Camp George West is located adjacent to and south of the STM site, and a portion of this land was acquired by NREL during 1999, as shown on Figure 1.2.

Portions of the community of Pleasant View are located immediately to the south and west of the western portions of the STM site. Offices, shops, and a tree nursery owned by the Colorado State Forest Service are located at the far western edge. Undeveloped state land and a Colorado State Highway Patrol pursuit driver training track are located along the northwestern boundary of the STM site.

Jefferson County open space wraps around the northern and the eastern edge of the site. Portions of the DWOP lie to the east.

## **2.2. National Wind Technology Center**

### Geology, Soils, and Hydrogeology

The NWTC site is located on a plain formed by stream deposits. The uppermost geological layer beneath the site is known as the Rocky Flats Alluvium (RFA). It is composed of cobbles, coarse gravel, sand, and gravelly clay. Below the RFA is the Laramie Formation, Fox Hills Sandstone, and Pierre Shale. These rock formations consist primarily of claystones with some siltstones. Unconfined groundwater flow occurs in the RFA toward the east/southeast, and small perched zones are common. Groundwater occurs as confined aquifers in the deeper bedrock formations (EG&G Rocky Flats, Inc., 1992).

The NWTC has a strongly developed soil defined as a very cobbly, sandy loam. The soil is characterized by a large amount of cobble and gravel in the soil volume, and a subsoil dominated by clay (USDA, 1995).

### Surface Water

The area surrounding the NWTC site is drained by five streams: Rock Creek, North Walnut Creek, South Walnut Creek, Woman Creek, and Coal Creek. Rock Creek flows eastward and is located southeast of the NWTC. North Walnut Creek and South Walnut Creek flow eastward into the Great Western Reservoir. Woman Creek drains eastward into Standley Lake. Coal Creek flows in a northeasterly direction across the City of Boulder open space north of the NWTC.

The majority of the NWTC drains into a tributary to Rock Creek. Some of the northern portions of the site drain into Coal Creek or its tributaries.

### Vegetation

The NWTC is predominantly characterized by dry pasture vegetation of several varieties. There are also four small areas of moist, low scrub or moist meadow. Vegetation characteristics of the site include perennial grasses and forbs, shrubs, and cacti.

Along the Northwestern ridge is a Ponderosa pine woodland area. Vegetation found in this area includes woody species with an understory of grasses, forbs, and shrubs.

#### Wildlife

Prior to 1975, the NWTC site was heavily grazed by livestock, damaging a majority of the native vegetation. A wildlife survey was conducted in 1992 for the entire Rocky Flats Plant and buffer zone area, including the NWTC site. Signs or tracks of bears and mountain lions were identified. Other mammals known to feed at the site are mule deer, coyotes, desert cottontail rabbits, white-tailed jackrabbits, black-tailed jackrabbits, deer mice, prairie voles, and thirteen-lined ground squirrels. Approximately 20 different species of birds were sighted at or near the site. Raptor (birds of prey) surveys were conducted at the NWTC in 1994 and 1995, and identified seven raptor species on or in the vicinity of the site.

#### Land Use

The NWTC facility occupies a 112-hectare (280-acre) area surrounded by open grazing land, with the exception of operations at the Rocky Flats Environmental Technology Site, which borders the NWTC to the southeast, and a sand and gravel mining operation along the southern and western boundaries of the site. A blasting company also has a small installation along the western site boundary.

### **2.3. Denver West Office Park**

The DWOP is a relatively flat, landscaped office complex occupied by a number of four-story buildings, parking lots, and common areas. NREL-leased facilities at DWOP are located approximately in the geographic center of the development. The DWOP is bordered on the south by commercial areas (West Colfax strip); on the west by the Pleasant View residential area, Camp George West facility, and the STM site.

DWOP, which had been in unincorporated Jefferson County, was annexed by Lakewood in 1999. No impact to NREL is expected as a result of the annexation.

### **2.4. Joyce Street Facility**

The JSF is located in a commercial area surrounded by agricultural land, residential neighborhoods, and small businesses.

### **2.5. Meteorology**

The climate for the geographic region of NREL operations is classified as semi-arid, typified by sparse precipitation, low relative humidity, abundant sunshine, and large daily and seasonal temperature variations.

The area experiences moderate precipitation, with average annual rainfall less than 50 cm (20 in). Almost half of the annual precipitation occurs from March to June. Summer showers contribute 33% of the annual precipitation total. Precipitation begins to decrease significantly in the fall, and reaches the minimum during winter. Winter is the driest season, contributing less than 10% of the annual precipitation, primarily in the form of snowfall.

Spring is a season of unstable air masses with strong winds along the foothills and the Front Range. The highest average snowfall occurs in March, and the STM site can generally expect to experience at least one heavy snowstorm with totals exceeding 15 to 25 cm (6 to 10 in.).

The solar radiation (sunlight energy) of the region is excellent for outdoor research and testing of solar energy conversion devices and systems. Sunshine is abundant throughout the year and remarkably consistent from month to month and season to season.



**Figure 2.1 - South Table Mountain Site - Major Buildings, Conservation Easement Lands (center of photo, right of test track), NE View**



**Figure 2.2 -South Table Mountain Site - W View**



**Figure 2.3 - South Table Mountain Site - E View**





**Figure 2.4 - NWTC - NW View**



**Figure 2.5 - NWTC - W View**





**Figure 2.6 - NWTC - E View**

### **3. ENVIRONMENTAL PROGRAMS**

The objective of NREL's environmental management program is responsible stewardship of the environment, both on its DOE-owned sites and leased properties. NREL strives to protect the natural environment by minimizing or eliminating any adverse environmental impacts resulting from NREL activities. The Laboratory's environmental management program is integrated throughout all research and operations Centers and Offices. The program includes written environmental protection policy and program implementation documents. These are put into practice at all staff and management levels.

NREL's environmental management program includes components to address waste, air, water, natural resources, and land and soil issues, among others. Descriptions of the components of the environmental management program are provided in the following sections of this chapter. Sections are organized by resource. Each section is comprised of three areas of discussion: a summary of the environmental management of the resource, a discussion of any relevant permitting, and finally a summary of significant activities that have occurred throughout the year.

A summary of the permits and notifications that have been issued by regulatory agencies for NREL activities is presented in Appendix A. These permits are discussed in the relevant sections below.

#### **3.1. Air Quality Protection**

##### *3.1.1. Program Management*

###### Criteria, Hazardous, and Non-Criteria Pollutants

The Clean Air Act and State of Colorado laws and regulations delineate several main categories for air pollutants:

- Criteria air pollutants (e.g. carbon monoxide, nitrogen oxides, sulfur dioxide, particulate matter)
- Hazardous air pollutants (e.g. includes organic compounds, metals, corrosives, asbestos, radionuclides, and pesticides)

- Non-criteria pollutants (e.g. ammonia, hydrogen sulfide, pesticides, organic compounds, metallic compounds, corrosives, and ozone-depleting substances)
- Ozone depleting substances (e.g. chlorofluorocarbons or “freons”)

There are notification and permitting thresholds for criteria, hazardous, and non-criteria pollutants. Potential sources of these pollutants at NREL include boilers, emergency generators, experimental laboratory hoods, pilot scale research projects, and small pieces of equipment with gasoline or diesel engines. NREL maintains air emission inventories to track potential air emissions and identify whether notification and permitting could be required for a particular facility or activity. Fugitive particulate emissions from construction activities occurring on NREL’s sites are also a potential source.

#### Ozone Depleting Substances

Facilities that service refrigeration equipment containing ozone-depleting substances (ODSs) are required to file an annual notification with the Colorado Department of Public Health and Environment (CDPHE). This equipment servicing must be conducted by EPA-certified technicians, and NREL has certified technicians on staff that perform this type of service.

Another requirement of the State of Colorado’s ODS program is that all refrigeration equipment larger than 100 hp that uses ODSs be registered with CDPHE. NREL has two chillers at its Solar Energy Research Facility (SERF) that are registered with CDPHE.

#### Street Sanding

CDPHE regulations require federal, state, and local government facilities to track wintertime street sanding, and to make efforts to minimize sand use. NREL complies with this requirement and files an annual sanding report with CDPHE. During the period of November 1998 to May 1999, NREL used 20 tons of sand during 10 sanding episodes. This is consistent with the previous winter in which 30 tons of sand was used during 15 sanding episodes. NREL maintains 60 lane-miles of roads.

#### Vehicles

NREL leases 48 vehicles from the General Services Administration. These vehicles are used for a variety of transportation and special purpose activities, such as equipment moving and servicing, grounds maintenance, and travel between the NREL sites. Twelve of the vehicles are classified as Non-Special Purpose and are used as personal transportation only. These twelve vehicles are alternate-fuel vehicles, utilizing ethanol or compressed natural gas (CNG). It is NREL policy to replace standard vehicles with alternative fuel vehicles whenever possible. The remainder of the vehicles are classified as special purpose and include vehicles such as delivery trucks, dump trucks, and pickup trucks. These vehicles are usually not available with alternative fuel options.

### *3.1.2. Permitting*

Most potential sources of air emissions from NREL laboratory and facility operations in 1999 were small scale and did not require permitting. Permitting thresholds are generally 50, 500, 1000, or 2000 pounds, depending on the pollutant. Projected emissions for these sources were either below thresholds for air permitting or the state reviewed the operation and determined emissions to be negligible in terms of impacts to the environment.

Three Air Pollutant Emissions Notices (APEN) and permit applications were filed with CDPHE in 1999. Two were for the renewal of sitewide permits covering particulate emissions from construction areas; one permit covers the South Table Mountain (STM) Site and the other is in effect for the National Wind Technology Center (NWTC). These permits were received in the first quarter of 2000. The third APEN was filed for the proposed scale-up of the experimental pilot scale Thermochemical Process Development Unit, and is still under review by the State.

### *3.1.3. 1999 Activities*

The Jefferson County Health Department conducted an inspection of NREL's STM and NWTC ODS management activities on February 25, 1999 and December 15, 1999. It was determined that NREL was in compliance with the State ODS requirements.

## **3.2. Drinking Water**

### *3.2.1. Program Management*

Drinking water is provided to NREL's STM and Denver West Office Park (DWOP) sites by a public water supply, Consolidated Mutual Water Company. Water to the Joyce Street Facility (JSF) is also provided by a public water supply. NREL supplies drinking water to its NWTC by trucking in water from the Boulder public water supply through a subcontracted water hauler. NREL stores the water on site in an underground 15,000 gallon storage tank and an above ground 2000 gallon tank. The 15,000 gallon tank is filled by the water hauler, and water is pumped on demand to the 2000 gallon tank, where it is distributed to the Industrial User Facility (IUF) and Building 251.

Disinfection boosting is performed at the NWTC using an ultraviolet lamp system. Testing for bacteria, lead, and copper is performed according to the requirements of CDPHE. Current state requirements for NREL's site are as follows:

- Bacteria – monthly
- Lead and copper – annually

All samples are taken from one of the taps connected to the system. No bacteria was detected in any sample in 1999. Lead and copper in Building 251 and the IUF were below action thresholds established by the State.

Drinking water at the NWTC is filtered using a 1 micron filter. This would filter out any microorganisms (e.g. cryptosporidium or giardia) that are resistant to the disinfection. The filters used by NREL are third-party tested to confirm that they actually filter particles as small as 1 micron in size.

If any treatment is performed on supplied drinking water, state regulation requires that a State-licensed operator supervise the treatment. NREL hires a subcontracted operator with a Class D license to supervise the disinfection and filtration operations and to perform the necessary sampling.

### *3.2.2. Permitting*

NREL has a Public Water Supply Identification Number (PWSID) issued by CDPHE for the drinking water it provides at the NWTC. This identification number does not require periodic renewal, but periodic testing and recordkeeping is required in connection with the PWSID. No identification is needed for NREL's STM, DWOP, or JSF sites, as water is piped from another PWSID, and NREL does not alter or treat the water in any way.

### *3.2.3. 1999 Activities*

In July 1999, the State of Colorado performed an inspection ("sanitary survey") of the NWTC drinking water system, including the system configuration, the equipment, and the operating procedures. No violations were found. There were four recommendations made by CDPHE on their inspection report. These items were:

1. Discontinue ultraviolet disinfection, and maintain a chlorine residual instead.
2. Install screens over tank openings to the atmosphere to prevent contamination by insects or debris.
3. Ensure that a licensed operator supervises treatment operations.
4. Develop and post a Cross-Connection Control Plan to confirm that any potential outside sources for contamination of the drinking water supply have been addressed and remedied.

All recommendations offered by the State have been implemented with the exception of item #1. A chlorination system of disinfection to replace the ultraviolet light system is scheduled to be designed and installed during the first half of 2000.

### 3.3. Ground Water Protection

#### 3.3.1. Program Management

Because of the sensitive nature of the ground water resource, NREL is careful to evaluate all outdoor projects to attempt to eliminate their potential to impact ground water quality. If there are any materials used that could pose a potential ground water risk, the Laboratory typically insists that safeguards to protect ground water be established, such as secondary containment for equipment that could have the potential to leak oil, double wall tanks with leak detection for diesel fuel storage for NREL facilities' emergency generators, and bermed areas to contain experimental materials.

Ground water characterization was begun on the STM site in 1990 with the installation of a monitoring well network. Eight wells were installed on the toe of the mesa slope. Four wells were installed upgradient of NREL development in order to provide an indicator that contaminants were not being transported onto the NREL site, and four wells were placed in a generally downgradient direction to verify that NREL activities had not adversely affected ground water quality. Quarterly sampling was performed for five calendar quarters, followed by annual sampling for three years. There was no evidence of contamination found. In addition, routine follow-up sampling was done in 1997. Three of the initial eight wells were closed (according to state requirements) due to construction activities in 1993, and a fourth was found to be inaccessible during the 1997 sampling, presumably also due to construction activity in the area. Therefore follow-up samples were only collected from four of the original monitoring wells: three upgradient wells and one downgradient of NREL development. No evidence of contamination was found in the 1997 sampling.

NREL has not conducted groundwater monitoring at its leased DWOP site, as there have been no activities that pose an unusual risk to groundwater quality. If NREL had reason to suspect a groundwater quality problem, the issue would be addressed with Denver West Management. DWOP management contracted with an engineering firm to conduct a cursory groundwater monitoring study in 1988 adjacent to the NREL-leased buildings. Two monitoring wells were drilled. There were no detections of significant levels of contaminants.

The NWTC currently has no open or active groundwater wells. There was a water supply well that provided water to Building 251 when the site was operated by DOE's Rocky Flats Office. In 1993, NREL collected one round of water samples from this well and the associated water distribution and treatment system for the purpose of determining the most feasible alternative for water supply to the site. Based on the sampling results, it was determined that the maintenance and repairs required to make the existing well and treatment system effective were extensive, and there was an indication of the potential for trace organic compounds in the water. Therefore, when DOE's Golden Field Office assumed

landlord responsibility for the site in 1993, the connection between the building and the well was severed. The water supply well was plugged and abandoned in accordance with state regulations by an NREL subcontractor in 1996. Potable water is currently transported to the site, as described in Section 2.2. NREL has not done any other groundwater sampling at the site. Groundwater sampling will be conducted if future activities pose a risk to the groundwater quality.

There has been no ground water study performed by NREL at the JSF, as NREL has not conducted any activities at the site that pose an unusual risk to ground water. All activities at the site are conducted inside the facility with the exception of routine deliveries and pick-up of inventory stored in the warehouse.

With one exception, there is currently no ongoing routine ground water monitoring program on any NREL site, because there have been no activities identified that currently or historically posed a significant risk to ground water. The one occurrence that had the potential to impact ground water was a diesel leak to the environment in June 1998 from a failed ball valve on the PDU emergency generator above ground storage tank at the Alternative Fuels User Facility. The majority of contaminated soil was excavated and removed from the site for disposal at a permitted landfill. Three ground water monitoring wells were installed at the site in September 1998, one upgradient, and two downgradient. No hydrocarbon contamination was detected in the ground water during the initial sampling. Follow-up sampling is being performed at semi-annual intervals for a period of two years after the spill. Results of the semi-annual sampling are discussed in Section 3.3.3.

### *3.3.2. Permitting*

All ground water monitoring wells installed by NREL at the STM site have been permitted with the Colorado Department of Natural Resources. Abandonment paperwork has also been filed with the State of Colorado for the three wells that were plugged in 1993.

### *3.3.3. 1999 Activities*

Follow-up ground water sampling at the site of the 1998 diesel spill from the PDU emergency generator storage tank was conducted in March and September 1999 from each of the three wells. No hydrocarbons were detected in the initial September 1998 sampling or in the two follow-up sampling events in 1999. The final semi-annual follow-up samples were collected in March 2000, and NREL is currently awaiting laboratory results.

### **3.4. Wastewater Discharge**

#### *3.4.1. Program Management*

Wastewater from NREL's STM and DWOP facilities flows into the Pleasant View Water and Sanitation District's system and ultimately to Metro Wastewater Reclamation District's (Metro) treatment plant. Wastewater from the JSF flows into the City of Arvada's collection system where it is also routed to Metro's treatment plant. The NWTC is not connected to a sewer system, but has two septic systems that include tanks and absorption fields for the treatment of wastewater.

It is NREL policy that hazardous chemicals are not to be discharged to the sewer system, and NREL staff are trained in this policy. In addition, NREL sites have design criteria for waste drains in lab areas to minimize the possibility of a hazardous material discharge. These criteria include measures such as raised lips on sinks in laboratory exhaust hoods where chemicals might be used, no floor drains in laboratory areas unless a specific need can be shown, and caps for any floor drains that are installed in lab areas. New research and operations activities as well as ongoing activities that undergo significant modifications are reviewed for their potential effect on wastewater character through NREL's risk assessment process.

Quarterly wastewater monitoring at the DWOP leased facilities and at the STM site was initiated in mid-1992 and continued throughout 1994 to demonstrate that NREL facilities' wastewater effluent met local publicly owned treatment works, state, and EPA standards. Both 24-hour composite and grab samples were collected and demonstrated that discharges from Building 16 in the DWOP and the FTLB met all applicable regulatory standards.

Manual grab sampling was also performed at the Building 15 photography laboratory wastewater sump with the same frequency as the other sampling during 1992 and 1993. The sump was decommissioned in 1994, and direct sampling of photo lab wastewater streams was conducted throughout 1994 to verify that standards were met.

#### *3.4.2. Permitting*

No permitting for the majority of NREL's wastewater discharges is required. NREL has no direct wastewater discharges to the environment at the STM, DWOP, or JSF, so no National Permit Discharge Elimination System (NPDES) permitting is necessary. NREL facility wastewater is discharged to Metro through the sanitary sewer system. NREL facilities are currently classified as nonindustrial water users at these sites because they discharge less than 97,633 L (25,000 gal) per day from each connection to the sewer system, and their effluent does not contain any toxic pollutants. As nonindustrial users, NREL sites do not

need a permit from Metro for sewer discharge, and monitoring for pollutants in wastewater is not required.

NREL provided notification and obtained septic permits from Jefferson County (an authority delegated to the counties under a State of Colorado program) for the NWTC septic systems as well as for the new Solar Radiation Research Laboratory (SRRL) facility that is discussed in Section 3.4.3.

#### *3.4.3 1999 Activities*

A new facility, the SRRL, was constructed in 1999 on the mesa top of the STM site. The facility houses NREL's metrology program that includes work in the areas of solar radiation measurement and equipment calibration. As there was previously no wastewater service to the mesa top, a septic system that included a tank and absorption field was installed to handle wastewater from the new facility.

### **3.5. Surface Water Protection (Storm Water)**

#### *3.5.1. Program Management*

Limited storm water monitoring was conducted at the STM site during the summers of 1992 and 1993 to characterize surface water quality at NREL's existing level of activity at that time, and to confirm that NREL's activities were not adversely impacting storm water quality on the STM site. Sampling indicated that NREL's activities are not resulting in contamination of storm water runoff.

No storm water monitoring has been conducted at NREL's other sites. In 1998, surface water samples were taken in two drainages at the NWTC in connection with NREL's weed control efforts. No traces of the herbicide applied to weed-infested areas were detected in the water samples.

Outdoor research projects are reviewed during the planning stages, through NREL's risk assessment program, for potential impacts to surface water. Measures to prevent such impacts are incorporated, as appropriate, into the design for each project. Such control measures could include secondary containment and bermed areas where chemicals will be used, or installation of a cover or roof to protect chemical use and storage areas from precipitation and adverse weather conditions.

Storm Water Pollution Prevention Plans (SPPP) have been written for construction activities on both the STM and NWTC sites. Erosion and sediment controls are implemented according to the plans, and periodic site inspections are conducted to verify that the controls are functioning properly and to identify any repairs to the erosion and sediment controls that are needed. Provisions of the



SPPPs are implemented through coordination with NREL's construction subcontractors.

### *3.5.2. Permitting*

NPDES permitting for storm water discharges on federal facilities in Colorado is under the jurisdiction of the Environmental Protection Agency (EPA). NREL is currently covered under EPA's general permit for storm water discharge associated with construction activities on the STM and NWTC sites. Both Midwest Research Institute, as operator, and DOE, as site owner, have been issued permits. EPA has issued separate permit numbers for each owner and operator at each site for a total of four permit numbers. No permits are required for NREL's routine operations.

## **3.6. Waste Management**

### *3.6.1. Program Management*

Hazardous wastes are handled and disposed according to the Resource Conservation and Recovery Act (RCRA). NREL facilities' waste profile consists of hazardous laboratory chemicals that would be typical of any university laboratory operation. Chemicals in solid or liquid form are collected in each laboratory or at each experimental site. These wastes are periodically collected from the laboratories and prepared by the NREL ES&H Office for off-site disposal.

It is NREL's policy to have the majority of its RCRA-regulated wastes incinerated, rather than landfilled, in order to more completely destroy the hazardous constituents and minimize any potential for future public exposure. This treatment and disposal is conducted at an EPA-permitted treatment, storage, and disposal facility. In addition, NREL facilities have adopted a conservative waste disposal policy in which materials that are not regulated by RCRA, yet pose a potential hazard, are collected and disposed of as nonhazardous material at a RCRA-permitted disposal facility.

As a facility that focuses on renewable technologies, NREL is committed to responsible environmental stewardship. A significant part of this effort is pollution prevention. NREL's Pollution Prevention Plan is consistent with the EPA's hierarchy of preventing or reducing pollution at the source; recycling or reusing waste materials that cannot be prevented; and environmentally safe treatment and disposal of waste that cannot be prevented, recycled, or reused.

### *3.6.2. Permitting*

NREL has four separate sites that have the potential to produce limited quantities of hazardous materials. Each of the four sites has a Resource Conservation and

Recovery Act (RCRA) waste generator identification number issued by the State of Colorado. The South Table Mountain and Denver West Office park locations are classified as "small quantity generators," generating less than 1000 kg of waste per month. The other two sites, the Joyce Street Facility and the National Wind Technology Center, are classified as "conditionally exempt small quantity generators," generating less than 100 kg of waste per month.

### 3.6.3. 1999 Activities

NREL generated 9500 pounds of hazardous waste from routine activities in 1999. This level of waste generation is consistent with previous years. Quantities of materials disposed during 1999 are listed in Table 3.1. The quantities listed are approximations only. The materials are normally not weighed when picked up by disposal or recycling vendors. Typically, a vendor will provide its good faith estimate of quantity based on practical experience. The table also includes quantities of wastes that were non-routine (i.e., generated on a one-time basis). These types of items are usually associated with project close-out activities or periodic routine maintenance activities. The quantity and types of these items vary from year-to-year.

NREL facilities also generate a very small amount of low level radioactive waste. The average amount of radioactive waste generated is typically less than 1 cubic meter (about 10 to 20 kg) per year, including packing material. This waste normally consists of personal protective equipment such as gloves and water-based liquids. Radioactive waste is shipped off-site for disposal on an as-needed basis. Details about the types and quantities of radioactive materials used at NREL facilities are provided in Section 4.0.

**Table 3.1 – Waste Quantities Generated in 1999**

<b><u>Material Type</u></b>	<b><u>Qty In Kg</u></b>	<b><u>Qty In Lbs</u></b>
Corrosive Liquids	3006	6613
Flammable Gas	29	63
Flammable Liquids	1008	2217
Flammable Liquids (non-routine)	9620	21,165
Flammable Solid	20	43
Water Reactive	36	80
Oxidizer	64	140
Toxic Materials	1468	3230
Non-RCRA Regulated	4457	9805
Low-Level Radioactive	12	27

### **3.7. Storage Tanks (Underground and Above Ground)**

#### *3.7.1. Program Management*

NREL facilities no longer have any underground storage tanks. Instead, NREL facilities store diesel for emergency generator and research use in aboveground storage tanks. NREL's tank management program focuses on proper tank design, operation, and inspection to protect against spills and leaks. The program is designed to meet regulatory requirements, and it is more stringent than the regulations require in many areas.

Several important safeguards have been incorporated into NREL's policy for tank management to prevent any accidental releases of diesel fuel from the storage tanks. These safeguards include both mechanical safeguards, such as double wall tanks with sensors that result in an alarm if the inner tank wall is leaking, overfill prevention, and spill protection; and procedural safeguards such as written operating procedures and tank filling procedures. All tanks larger than 110 gallons are visually inspected at least once per month.

Due to the quantity of diesel fuel stored on the STM site, a Spill Prevention Control and Countermeasures Plan is required to be in place. This Plan describes the site topography and neighboring areas, and outlines the steps necessary to mitigate any spills or leaks of diesel fuel. To date, NREL has not had any offsite impacts related to tank activities.

#### *3.7.2. Permitting*

Tanks larger than 660 gallons are required to be registered with the State of Colorado, with the registration renewed annually. Currently, only two tanks meet the registration threshold, the SERF emergency generator diesel storage tank and the PDU ethanol storage tank at the AFUF. The State has inspected each of NREL's registered tanks in the last year, and found no deficiencies in the management or operation of the tanks. The NREL tank inventory is presented in Table 2.2.

#### *3.7.3. 1999 Activities*

There were no spills or leaks from NREL tanks during 1999.

### **3.8. Hazardous Materials Management**

#### *3.8.1. Planning and Reporting*

No hazardous waste sites have been identified on any of the Laboratory sites. Therefore, many sections of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) do not apply to NREL facilities. However, NREL sites are subject to the emergency reporting sections of CERCLA that require the reporting of any releases of reportable quantities (RQ)

of chemicals. During 1999, the Laboratory had no releases to the environment of chemicals reportable under this section.

NREL facilities are also subject to the emergency reporting requirements in Title III of the Superfund Amendments and Reauthorization Act (SARA), also known as the Emergency Planning and Community Right-To-Know Act (EPCRA). These regulations require a facility to notify the State Emergency Response Commission that it is subject to emergency planning and notification requirements if any chemicals in the facility's inventory are stored in quantities greater than prescribed threshold planning quantities (TPQs). NREL facilities first became subject to planning and notification requirements in 1988.

**Table 3.2 – Above Ground Storage Tank Inventory**

<b><u>Tank ID</u></b>	<b><u>Size</u></b>	<b><u>Contents</u></b>	<b><u>Use</u></b>	<b><u>Date On-Line</u></b>	<b><u>Service Status</u></b>
No. 2	800 gallons	Diesel	SERF Emergency Generator	10/93	In-Service
No. 3	6000 gallons	Ethanol, 50%	PDU Ethanol Storage	12/95	In-Service
No. 4	564 gallons	Diesel	PDU Emergency Generator	8/95	In- Service
No. 5	560 gallons	Diesel	FTLB Emergency Generator	6/96	In-Service
No. 6	400 gallons	Diesel	IUF Emergency Generator	3/97	In-Service
No. 7	80 gallons	Diesel	251 Emergency Generator	1980	In-Service
No. 8	500 gallons	Diesel	Hybrid Power Test Bed	6/97	In-Service
No. 9	500 gallons	Diesel	Bldg 16 Emergency Generator	1990	In-Service
No. 10	100 gallons	Diesel	NWTC NPS Daytank	6/96	NC
No. 11	100 gallons	Diesel	NWTC HPTB North Daytank	6/97	NC
No. 12	100 gallons	Diesel	NWTC HPTB South Daytank	6/97	NC
No. 13	50 gallons	Diesel	SunWize	5/98	NC
No. 14	200 gallons	Diesel	251 Stand-by Generator	9/98	In-Service
No. 15	100 gallons	Diesel	AFUF Emergency Generator	6/94	NC

Service Status

In-Service (IS)  
Out-of-Service (OS)  
Temporary Closure (TC)  
Permanent Closure (PC)  
Change-In-Service (CIS)  
NC—not covered by this Program

There are also reporting requirements in the event of a release of an RQ of any hazardous substance listed by EPCRA. In 1999, NREL facilities had no release exceeding the RQ of any reportable material under EPCRA.

NREL provides Material Safety Data Sheets (MSDSs) for chemicals that are stored on-site in quantities greater than TPQs, and provides inventory reporting for these same chemicals in the form of Tier I or Tier II reports to emergency planning and response groups. While NREL facilities currently have no chemicals on-site that exceed TPQs, the Laboratory has submitted MSDSs and Tier II reports in the past when required.

NREL provides emergency response and reporting information to the Jefferson County Emergency Planning Committee (EPC), the State Emergency Response Commission, and West Metro Fire Rescue when requested. The Jefferson County EPC uses Uniform Fire Code hazard categories and threshold reporting quantities rather than those specified in SARA Title III, resulting in a larger number of individual hazard categories and lower reporting thresholds. NREL has an active involvement in the emergency planning concepts of SARA Title III, in that the Laboratory currently has an acting member on the Jefferson County EPC, and has been so represented since the EPC's inception.

SARA Section 313 requires that a toxic chemical release inventory report (Form R) be filed with EPA for any chemical that is manufactured, processed, or otherwise used in quantities exceeding TPQs. As a research and development Laboratory, NREL does not manufacture or process any materials, and during 1999, the Laboratory did not use any materials on the Section 313 list in quantities exceeding the 4536-kg (10,000-lb) threshold planning quantity. Therefore, no reporting under Section 313 is required. Although NREL is not a manufacturing facility and does not fall within any of the Standard Industrial Classification (SIC) codes for which Section 313 reporting is required, Executive Order 12856 requires all federal facilities to report regardless of SIC code if the threshold quantities are met.

### *3.8.2. Permitting*

NREL has applied to West Metro Fire Rescue for Hazardous Materials Permits. Permits are generally issued by building, and NREL has requested a total of six permits. Application was made during the first quarter of 2000.

### *3.8.3 1999 Activities*

#### *Chemical Management System*

During 1999 a new Laboratory-wide chemical management system (CMS) was implemented at NREL. It serves as a centralized chemical inventory as well as a tool for managing and reporting on chemicals used at the Laboratory. Using an electronic barcoding system, the CMS tracks chemicals from the point of receipt through disposal. Key functions of the system include:

- Providing current inventories by room, building, and/or site
- Improving research efficiency and minimizing hazardous waste generation by allowing staff to determine if needed chemicals are already available on site prior to making chemical purchases
- Providing quick access to chemical inventories and hazard information during emergency responses
- Facilitating accurate and efficient reporting to external agencies (e.g. fire districts, EPA, DOE)

A physical inventory of each lab and work area in which chemicals are used or stored was conducted in 1999 in order to populate the database. This inventory effort was completed in the first quarter of 2000.

Implementation of CMS will continue in 2000 to input technical data and reporting information for each chemical into the CMS database. When implementation is complete, the CMS will be fully functional as a tool for thorough and efficient management of chemicals at NREL, and will provide necessary information for emergency response and reporting purposes.

#### *Building 16 Asbestos Survey*

NREL has not identified any areas within its facilities that contain residual contamination requiring special decommissioning. During 1999 an asbestos survey of Building 16 was conducted. Asbestos-containing materials were identified in laboratory vent hoods, floor tile, and vapor barrier mastic.

### **3.9. Natural Resource Issues**

#### *3.9.1. Vegetation Management*

##### *3.9.1.1 Program Management*

NREL's basic philosophy regarding vegetation is to preserve and protect the ecosystems on the site in their natural state as much as possible. There is some landscaping using non-native drought-tolerant species adjacent to some of the buildings, and even a few areas at the STM site of sodded bluegrass. However the native vegetation and natural character of the landscape is maintained over the majority of the site. Revegetation of areas to be left in their natural state following disturbance from construction or other outdoor activities is conducted using a native seed mix of grasses and forbs. This mix is comprised predominantly of natives that were originally present on the site before disturbance. The use of native species is strongly encouraged at both the STM and NWTC sites whenever feasible.

A vegetation survey of the STM site was conducted in support of the 1993 sitewide Environmental Assessment, and a site reconnaissance was performed by Dames & Moore biologists in November 1997 (U.S. DOE, 1998, page 3-1).

Weed control efforts have been ongoing since 1997 at the NWTC and 1998 at the STM site. NREL uses an integrated weed management approach that incorporates various types of weed control methods. Some of these include mechanical practices (e.g. mowing), cultural (reclamation of disturbed areas), prevention (e.g. obtaining certified weed free mulch; limiting or eliminating driving of vehicles off established roadways), herbicide treatment, and biological controls. The effectiveness of control methods is periodically assessed. The use of multiple strategies for control has been successful in significantly reducing populations of diffuse knapweed and Canada thistle on the sites. The key aspect of the weed control program is to maintain flexibility to respond to the changes in weed populations from year to year.

#### *3.9.1.2 Permitting*

There is no permitting applicable to vegetation management, although there is a State weed law that requires property owners to control certain species of invasive weeds (e.g. diffuse knapweed). For application of certain types of herbicides designated as “restricted use” by EPA, a certified applicator must be used. Herbicide applications at NREL are always performed by a certified applicator. The exceptions are herbicides used for control of undesirable vegetation along walkways, roadways, and adjacent to facilities. These are typically Round-Up and Weed-B-Gon and are applied by NREL Site Operations staff pursuant to an NREL Safe Operating Procedure (SOP).

#### *3.9.1.3 1999 Activity*

In 1999, a verification survey of STM site vegetation was performed on the Conservation easement property to identify any changes to habitat character or species types that may have occurred since the 1993 and 1997 surveys. An effort was made to determine whether any sensitive species or habitats that could potentially support such species were present on the site. No sensitive species or potential habitats were identified on the STM site.

A three-season vegetation survey of the NWTC site is currently underway. It began in August 1999 and will conclude in August 2000. The survey will identify the species present on the site as well as any sensitive species or habitats. The locations of the various community types will also be identified. Weed populations will be surveyed and recommendations regarding appropriate weed control strategies will be made. In addition, a native seed mix based on native species present on the site will be developed.

In 1998, aerial herbicide application of Tordon 22K was conducted using helicopter application over about 200 acres of the NWTC to target diffuse knapweed. It has been very effective in controlling the weed, and healthy stands of native grasses have proliferated with the decrease in weed competition. Also at the NWTC in 1998, sensitive areas adjacent to



drainage areas and trees were treated using ground application with the herbicide, Transline, to control diffuse knapweed, and small areas of Canada thistle were treated with Telar. At the NWTC in 1999, spot spraying on the ground using tractor and backpack applicators was performed to target remaining pockets of diffuse knapweed and Canada thistle.

Weed infestations at the STM site were much less severe than at the NWTC. At the STM site in 1998 and 1999, limited ground application of herbicides was conducted, applying Transline to diffuse knapweed and Telar to Canada thistle infested areas.

### *3.9.2. Endangered Species/Species of Concern*

The Endangered Species Act provides for the designation and protection of wildlife, fish, and plant species that are in danger of extinction and preserves the ecosystems on which these species depend. A wildlife survey was completed on the STM site in 1987 (The FORUM Associates, Inc., 1987a), at which time no threatened or endangered species or candidate wildlife species for endangered designation were found. The most recent vegetation survey of the STM site was completed in 1999 for the *National Renewable Energy Laboratory (NREL) Site Conservation Easement Baseline Inventory* (U.S. DOE 1999). No threatened, endangered, or candidate plant species were identified in the survey.

Additional surveys of wildlife on the Conservation easement property were conducted in 1999, also for the Baseline Inventory. The U.S. Fish and Wildlife Service lists five threatened and endangered animal species that may potentially occur in the property area, including American peregrine falcon, bald eagle, Eskimo curlew, Mexican spotted owl, and Prebles meadow jumping mouse. The Colorado Natural Heritage Program database lists three animal species of interest that may potentially occur in the property area, including common shiner, arogos skipper, and ottoe skipper. No suitable habitat is present for any of these species on the Conservation easement property.

No threatened, endangered, or candidate species of either plants or animals have been identified to date on the NWTC site. A vegetation survey is ongoing at the NWTC, as described in Section 2.9.1, that is intended to identify any sensitive species or habitats on the site. If any such species or habitats are identified, they will be discussed in the Annual Environmental Report for 2000.

Field research into avian use of the NWTC was conducted during 1994 and 1995 in an effort to identify potential impacts on birds from wind-turbine research. While several species of raptors, including red-tailed hawks, kestrels, and a great-horned owl were noted on the site, they were primarily transient in nature. The NWTC appears to be used primarily for loafing and hunting, although one pair of kestrels nested in an old concrete pole during the spring. Birds of prey of

concern, such as eagles, generally fly in excess of 152 m (500 ft) over the site. No significant impacts to the birds from NREL activities were found.

### *3.9.3. Wetlands/Floodplains*

Limited wetland areas totaling less than 0.3 ha (0.75 ac) occur on the STM site in the drainage bottom located east of the SERF. These are narrow, linear wetlands supporting spikerush, baltic rush, sedges, bluegrass, hemlock, and field mint. These wetlands will be protected from adverse impacts as site development continues.

Wetland areas at the NWTC are extremely limited in extent as well. These areas, along the site's eastern boundary, total less than 0.4 ha (1 ac).

According to maps generated by the Jefferson County Department of Highways and Transportation as part of its urban drainage studies, NREL's STM site does not contain any floodplains, and to date, no floodplains have been identified at the NWTC. As a best-management practice, however, all construction activities that may cross a drainage channel are designed to meet the 100-year flood control standards (designed to withstand the equivalent of a 100-year flood).

## **3.10. Cultural Resources**

Two formal surveys of historic and cultural resources have been performed on the STM site. These surveys were completed in 1980 and 1987. As a result of these surveys, three historical sites were recognized as significant cultural resources that should be preserved. These sites include an open-air amphitheater, a stone bridge spanning a natural drainage channel adjacent to the amphitheater, and a stone and concrete ammunition bunker below the amphitheater site. The three structures were constructed during the Works Progress Administration (WPA) era in the 1930s. Through NREL's efforts, these sites have been added to the National Register of Historic Places (National Register), with the amphitheater and stone footbridge listed together as a single site. NREL also participated in an interagency survey of South Table Mountain and Camp George West to identify historic structures and sites eligible for nomination to the National Register.

An archaeological survey of the NWTC site was conducted in support of the 1996 Environmental Assessment. No significant historical or archaeological resources were identified.

## **3.11. National Environmental Policy Act (NEPA)**

As a federal agency, DOE is obligated to comply with NEPA when conducting its activities. Regulations for compliance with the Act are issued by the Council of Environmental Quality (CEQ). DOE has also issued implementing regulations at 10 CFR that complement the CEQ requirements. DOE has written a sitewide

Environmental Assessment (EA) for its activity at the STM Site and DWOP, and separate EAs for the NWTC and JSF activities.

NREL has established procedures, with the approval of the DOE GO, to assist DOE in meeting their NEPA obligation. Proposed activities that will be conducted off of NREL's four sites are evaluated for their potential environmental effects using the appropriate level of NEPA review, in conjunction with GO.

The NREL NEPA Handbook has been prepared to provide NREL project managers and procurement specialists with guidance on implementing the NEPA procedures.

### **3.12. Radiological Issues**

#### *3.12.1. Program Management*

All radioactive material at NREL facilities are handled according to NREL's Radiological Control Program. Elements of the program include a radiological control organization, a radiation safety policy and control manual, safe operating procedures, safe work permits, radiological control areas and postings, monitoring, training, and purchasing controls for radioactive materials.

There are no nuclear operations at NREL sites. The majority of radiation sources are used/stored in facilities located on the STM site. These include three x-ray diffraction machines at the SERF and two sealed source level gauges at the AFUF used on pilot scale processes to measure the level of material inside process tanks. In addition, one laboratory at the FTLB, on the STM site, occasionally uses small quantities of radioisotopes for biological or chemical labeling. During 1999, limited scintillation counting was done in Building 16 on the DWOP. Scintillation counting will be done in the upcoming year in the FTLB, as the scintillation counting equipment was moved to the STM site in January 2000.

The three X-ray diffraction machines are registered with the State of Colorado and are inspected every two years by a state-licensed surveyor. The surveyor inspects and certifies the X-ray machines and audits NREL's program for radiation safety in connection with operating the machines. X-ray diffraction machine inspections were performed in February (one machine) and December (two machines) of 1999, and the equipment was recertified for another two years.

No radioactive air-emission monitoring is conducted because of the extremely low usage of radioactive material at NREL facilities.

All radioactive waste generated during NREL activities is classified as low level waste. Waste from the STM site is temporarily stored at the Waste Handling Facility (WHF) until disposal is arranged at an offsite facility permitted to accept low level radioactive waste. Radioactive waste from the Building 16 lab is temporarily stored in the Waste Storage room on the first floor of the building.

Waste quantities are discussed in Section 2.6 of this report and shown in Table 2.1.

### *3.12.2. Permitting*

NREL does not have a radioactive materials license from the State of Colorado, as the Laboratory is currently under DOE jurisdiction for radioactive materials handling.

### *3.12.3. 1999 Activities*

In 1999, radioisotope usage was limited to C-14. The activity of the isotope used was 15 uCi. NREL's total inventory of radioactive isotopes (excluding waste) as of February 1999 is as follows:

<u>Isotope</u>	<u>Activity</u>
C-14	7.031 mCi ( $2.6 \times 10^8$ Bq)
S-35	0
H-3	0.500 mCi ( $1.9 \times 10^7$ Bq)
P-32	0
U-238*	<u>0.211 mCi (<math>7.8 \times 10^6</math> Bq)</u>
Total	7.742 mCi ( $2.865 \times 10^8$ Bq)

\*naturally occurring

## **4. CONSERVATION EASEMENT LANDS**

During 1999, DOE placed 175 acres of the STM site in a Conservation easement. The purpose of the Conservation easement is to preserve the natural character of the property, including its visual, biological, and recreational resources, especially in relation to the changing land uses adjacent to the NREL site and within the region.

The goals of the easement are to:

- Retain, preserve and protect natural, scenic, ecological, and historical aspects of the conservation easement property;
- Protect the ecosystem of the South Table Mountain area and the sustainable habitat for biodiverse vegetation, birds, and terrestrial animals;
- Ensure the scenic and biological integration with adjoining open-space land;
- Prevent further industrial, commercial, or residential development of the conservation easement property; and
- Preserve the conservation easement property as natural open space.

A baseline inventory of the property was prepared in June 1999 to document the current condition of the easement property and to assess the conservation value of the property (Department of Energy, Golden Field Office, 1999). The baseline inventory includes a

description of the geographical setting and adjacent property owners, access and use of the property by the public, and a description of the existing environmental conditions of the property (geology, hydrology, vegetation, wildlife, cultural resources). There are also photos incorporated into the report that document the condition of the property.

#### **1999 Assessment of the Property:**

During 1999 there was no NREL activity on the conservation easement property having the potential to degrade the environmental condition of the property. Recent photos of representative areas of the easement lands are included in Section 2 of this report. Other photos taken in 1999 of conservation easement lands are included in the *National Renewable Energy Laboratory (NREL) Site Conservation Easement Baseline Inventory (U.S. DOE 1999)*.

### **5. NON-ROUTINE ACTIVITIES/SPECIAL PROJECTS**

During 1999, there were two significant non-routine activities. The first was the Integrated Safety Management (ISM) Validation by a team of DOE staff. The second was the moving of all existing Building 16 labs to the STM site.

The ISM validation was conducted over the course of a week in November 1999. Environmental program management was assessed through a document review and by interviews with NREL ES&H Office staff. Additional interviews with DOE Golden Field Office staff members were conducted by the ISM validation team.

The validation team recommended that NREL's ISM program be approved by GO. Some recommendations for improvement were made by the team, and these are being considered by NREL management in coordination with the ES&H Office and GO.

Laboratory moves out of Building 16 occurred over the course of several months in late 1999. Metrology labs were moved to the new Solar Radiation Research Laboratory facility that was recently completed. Most other labs were moved to newly constructed space in the FTLB. A few labs were moved to the AFUF. These moves were closely coordinated with the ES&H Office so that chemicals were properly handled, packaged, and transported. All moves were completed efficiently and without incident. The final moves occurred in the first quarter of 2000.

There are no non-routine activities currently planned for 2000. Any such activities that arise during the course of the year will be reported in the environmental report for 2000.

### **6. ENVIRONMENTAL OCCURRENCES**

There were two environmental occurrences during 1999 at the STM site, and one at the NWTC.

At the STM site, on February 19, 1999, the contents of an acid waste container was released on the pavement outside the SERF. The NREL Emergency Response Team was

activated to neutralize, collect, and clean up the spill. There was no environmental damage to the site and no reportable releases as a result of this incident.

Also at the STM site, on November 5, 1999 a small spill involving tertiary-butyl arsine (TBA) occurred in a laboratory at the SERF. TBA is a highly toxic and pyrophoric liquid used as one component material in the growth of semiconductors. The quantity spilled is estimated at about 100 ml.

The lab was immediately evacuated and the gas monitoring system for this area entered an alarm state. The NREL ERT was mobilized to develop a response strategy in cooperation with West Metro Fire Rescue (WMFR). WMFR assumed a support role and the response was handled by the NREL ERT to assess, stabilize, and collect the spilled material for appropriate disposal.

There was no reportable release as a result of this incident. A worst case estimate of the amount of TBA potentially released is approximately 0.24 pounds. The Reportable Quantity for releases of arsenic compounds is 1.0 pound.

At the NWTC on May 19, 1999, a leak of hydraulic fluid occurred due to failure of a mechanical oil seal on a manlift. Approximately 3 to 5 gallons of oil leaked onto the ground. The contaminated soil was collected and disposed of at an appropriate off-site facility.

## **7. SUMMARY OF SIGNIFICANT ENVIRONMENTAL ISSUES**

The CMS implementation will continue throughout 2000, with focus on entering technical and regulatory data into the database. Reinventory of some lab and work areas may be begun, depending upon budgetary issues.

## 8. REFERENCES

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## **9. APPENDIX**

### Summary of NREL Environmental Permits, Registrations, Notifications